

Litton

Airtron



Defense Production Act -- Title III
Silicon Carbide Substrates
Contract F33615-99-C-5318

Update for DARPA--EPRI
October 18, 2000

Presented by Jon Whitlock



Overview



Litton Airtron
Title III Program Objectives
Current Status

Thanks to M. Yoganathan, F. Long,
A. Gupta, A. Giordana, J. Burton,
and R. N. Thomas.

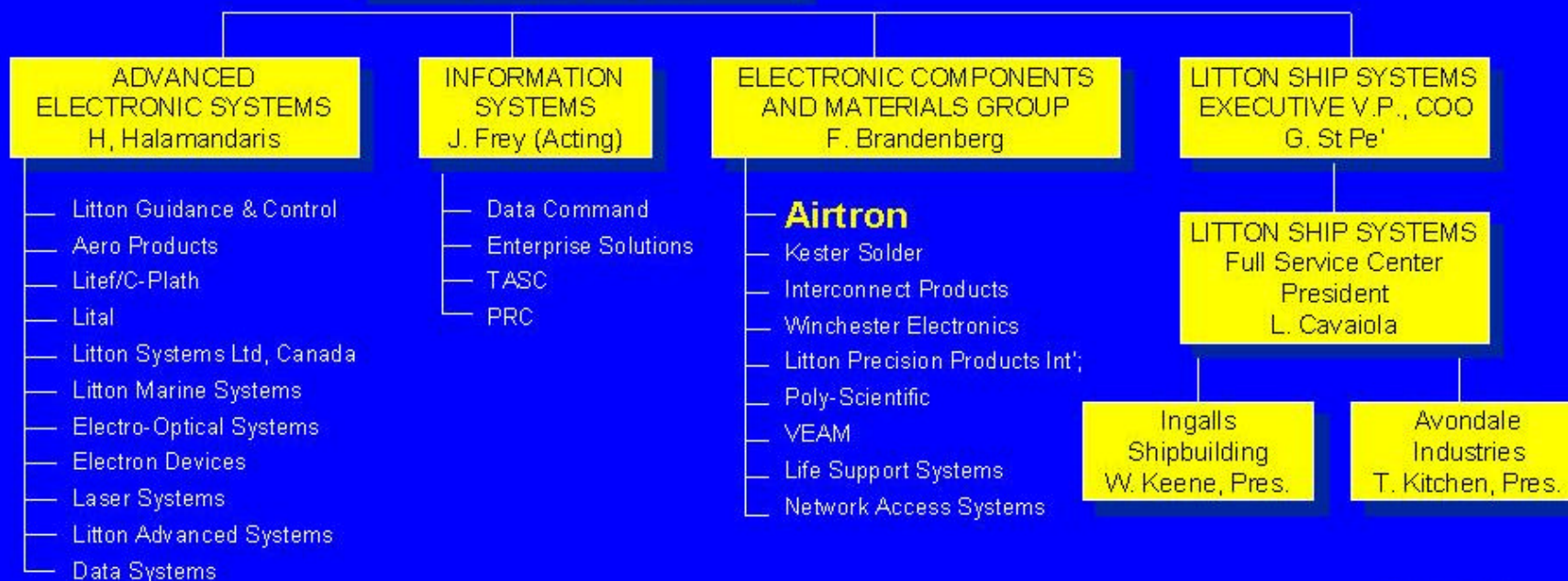
LITTON ORGANIZATION



LITTON INDUSTRIES, INC.
MICHAEL R. BROWN
CHAIRMAN OF THE BOARD, PRESIDENT & CEO

\$5.6 B Revenues
40,000 Employees

LITTON INDUSTRIES, INC.
PRESIDENT, COO
Dr. Ronald D. Sugar



October 18, 2000

AIRTRON ORGANIZATION



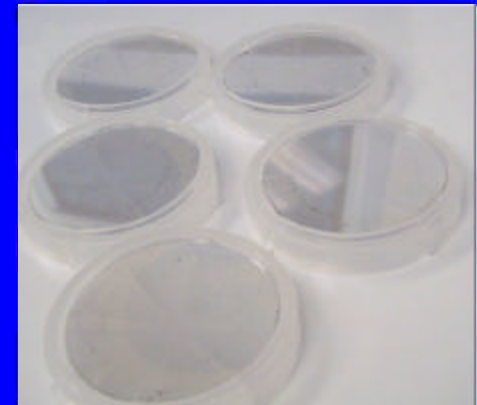
Airtron Electronic Materials Group Vision Statement



- ◆ The Electronic Materials Group (EMG) of Litton Airtron will become the world's leading supplier of compound semiconductor materials by expanding into the epitaxial segment of the semi-insulating gallium arsenide market through **new process developments, acquisitions and strategic customer alliances**; and by diversifying its **product line to include wide bandgap materials**.
- ◆ We will accomplish this by building an organization that seeks to continuously improve its operational effectiveness and encourages the enthusiastic participation of all personnel.

Litton
Airtron

Airtron Electronic Materials Group



From 150mm GaAs...



NORTHROP GRUMMAN

To Competitive
Supply of SiC
Substrates

October 18, 2000

Litton

Airtron



Title III Program

Program

Goals and Objectives

- ◆ 75mm Diameter
- ◆ 1 μ pipe/cm²
- ◆ 10¹⁵ cm⁻³ Purity
- ◆ >50% Cost Reduction
- ◆ 75 ksi/yr Capacity

Program

Efforts

- ◆ Six Growth Stations
- ◆ FEA Modeling Subcontractor
- ◆ Three Growth Scientists
- ◆ Two University Subcontractors
- ◆ Substrate Man. Experience
- ◆ Process Yield Improvement
- ◆ Economies of Scale
- ◆ Significant Investment from Corporate Parent

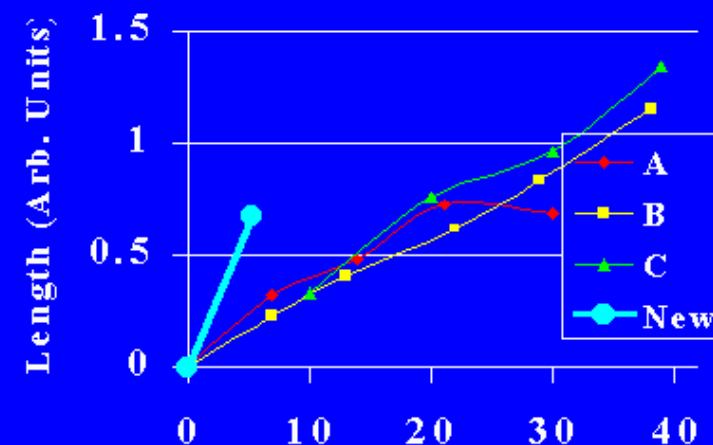
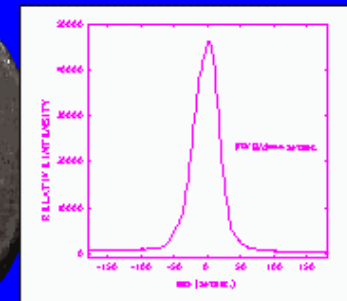
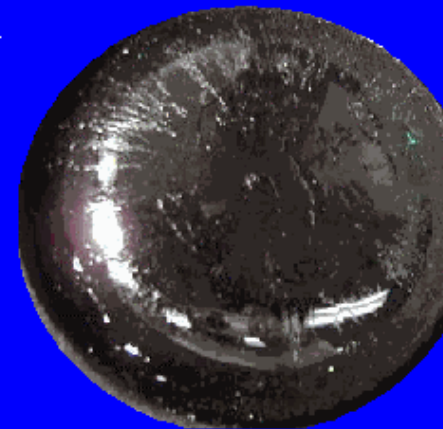
October 18, 2000

75mm Growth



- ◆ New hotzone configuration adopted in mid July.
- ◆ 3x Larger Source Charge
- ◆ FEA-improved design
- ◆ Short-run growths have shown improved source transport and transport consistency.
- ◆ Long crystals in one heat now practical.
- ◆ 45 arc-sec FWHM obtained:

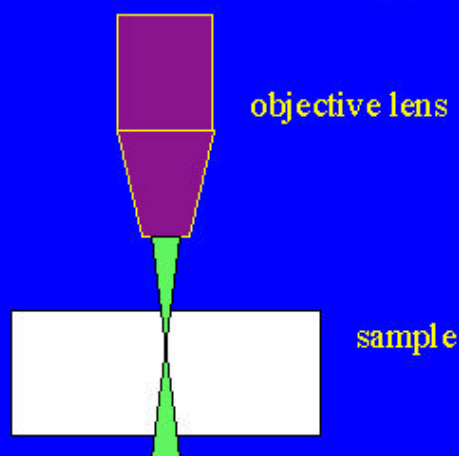
**Improved Growth Rate
and Quality**



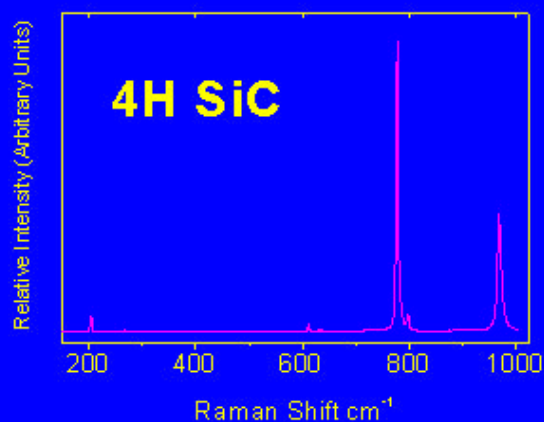
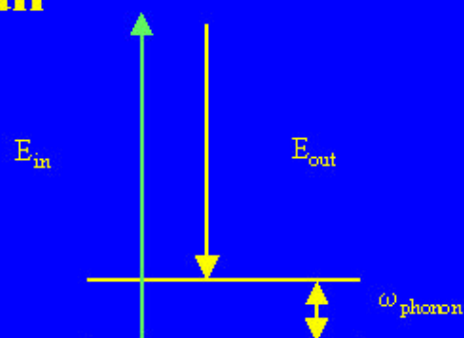
Duration (Arb. Units) October 18, 2000



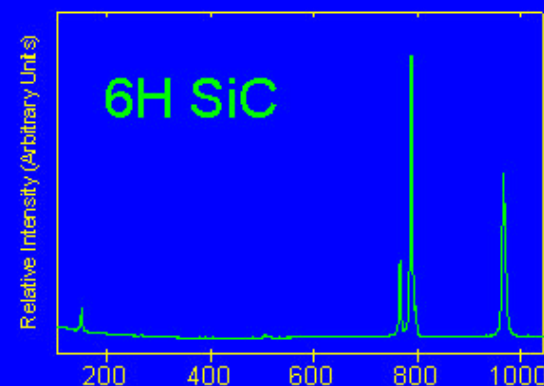
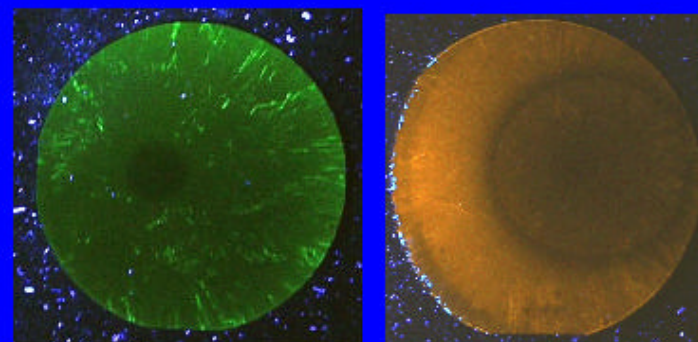
Confocal Raman Microscopy



Sample small volume
1-2 microns each direction



UV Photoluminescence



Raman spectra

Ingot Tracking Databases



Ingot ID	Fabrication	Growth	Anneal	Polishing	Storage
00	Save				2000-01-01
01	Save				2000-01-01
02	Save				2000-01-01
03	Save				2000-01-01
04	Save				2000-01-01
05	Save				2000-01-01
06	Save				2000-01-01
07	Save				2000-01-01
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47	Save				2000-01-01
48	Save				2000-01-01
49	Save				2000-01-01
50	Save				2000-01-01

- ◆ Current Online Databases
 - Growth/Fabrication
 - Post-Fabrication Inspection
 - Polishing
 - Wafer Storage